

# EXHIBIT D

# THE MERCCK INDEX

AN ENCYCLOPEDIA OF  
CHEMICALS, DRUGS, AND BIOLOGICALS

ELEVENTH EDITION

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*Published by*  
**MERCK & CO., INC.**  
RAHWAY, N. J. U. S. A.

1989

## Sodium Bisulfate

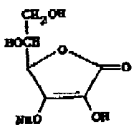
8531

$\text{Na}_2\text{O}_2$ ; mol wt 410.75. C 35.09%, H 2.63%, As 36.47%, N 6.82%, Na 11.19%, O 7.79%. Usually contains some water and inert salts (NaCl) and hence only about 20% arsenic (As).

Bright yellow powder. **Poisonous!** Very unstable in air. Freely sol in water with alkaline reaction. **Keep as described for Neosphenamine.** Solution for injection must be prepared immediately after opening the container and must be administered promptly.

Therap cat: Formerly as antisyphilitic.

**8525. Sodium Ascorbate.** Ascorbic acid sodium derivative; vitamin C sodium; Ascorbin; Sodascorbate; Natrescorb; Cenilate; Ascorbion; Cebitate.  $\text{C}_6\text{H}_7\text{NaO}_6$ ; mol wt 198.12. C 36.38%, H 3.56%, Na 11.60%, O 48.46%. One mg of the sodium salt is equivalent to 0.8890 mg of ascorbic acid, or one mg of the acid is equivalent to 1.1248 mg of sodium ascorbate. Preparation: Holland, U.S. pat. 2,442,005 (1948); ascorbic acid is dissolved in water and an equiv amount of sodium bicarbonate is added. After cessation of effervescence the sodium ascorbate is precipitated by the addn of isopropanol.



Minute crystals. Dec 218°.  $[\alpha]_D^{25} +104.4^\circ$ . Freely sol in water at 25°: 62 g/100 ml  $\text{H}_2\text{O}$ . Even more sol in warm water (78 g/100 ml  $\text{H}_2\text{O}$  at 75°). pH of aq solns 5.6-7.0 or even higher. A 10% soln, made from a commercial grade, may have a pH of 7.4-7.7. Aq solns are unstable and subject to quick oxidation by air at pH > 6.0. Solns can be buffered with ascorbic acid solns which have a pH of 2.3-2.5.

USE: In vitamin C preps; antioxidant in chopped meat and other food, also in curing meat.

Therap cat: Vitamin C source.

**8526. Sodium Azide.** Smitz.  $\text{N}_3\text{Na}$ ; mol wt 65.02. N 64.64%, Na 35.36%.  $\text{NaN}_3$ . Cytochrome oxidase inhibitor. Prep'd from  $\text{NaNH}_2 + \text{N}_2\text{O}$ : Dennis, Browne, *Z. Anorg. Allgem. Chem.* 40, 95 (1904); Schenk in *Handbook of Preparative Inorganic Chemistry* Vol. 1, G. Brauer, Ed. (Academic Press, New York, 2nd ed., 1963) pp 474-475. Alternate procedures: *Inorg. Syn.* 1, 79 (1939); 2, 139 (1946). Large scale manuf processes: B. T. Fedoroff et al., *Encyclopedia of Explosives and Related Items*, Vol. 1 (Picatinny Arsenal, Dover, N.J., 1960) pp A601-A619. Review: L. E. Audrieth, *Chem. Rev.* 15, 169 (1934). Potent vasodilator; has been used therapeutically to control blood pressure. Review of toxicity, mutagenicity and carcinogenicity: K. A. Frederick, J. G. Babish, *Regul. Toxicol. Pharmacol.* 2, 308-322 (1982).

Colorless hexagonal crystals, d 1.846. On heating dec into sodium and nitrogen. Highly sol in water. Rapidly converted to hydrazoic acid, q.v. Soly in water: 40.16% at 10°, 41.7% at 17°. pK = 4.3, aq soln contains  $\text{HN}_3$  which escapes readily at 37°. Slightly sol in alcohol. Insol in ether. Sol in liquid ammonia.  $\text{LD}_{50}$  in rats (mg/kg): 45 orally (Frederick, Babish).

**Caution:** Highly toxic. May cause hypotension, tachycardia, tachypnea, hypothermia, convulsions and severe headache: *Clinical Toxicology of Commercial Products*, R. E. Gosselin et al., Eds. (Williams & Wilkins, Baltimore, 5th ed., 1984), Section II, p 114; *Prudent Practices for Handling Hazardous Chemicals in Laboratories* (National Academy Press, Washington, D.C., 1981) pp 145-147.

USE: In organic syntheses; in the preparation of hydrazoic acid, lead azide, pure sodium. In the differential selection of bacteria; in automatic blood counters; as preservative for laboratory reagents. Propellant for inflating automotive safety bags. Agricultural nematocide; herbicide; in fruit rot control.

**8527. Sodium Benzoate.**  $\text{C}_6\text{H}_5\text{NaO}_2$ ; mol wt 144.11. C 58.34%, H 3.50%, Na 15.96%, O 22.21%. Toxicity: Smyth, Carpenter, *J. Ind. Hyg. Toxicol.* 30, 63 (1948).



White, odorless granules or crystalline powder; sweetish, astringent taste. One gram dissolves in 1.8 ml water, 1.4 ml boiling water, about 75 ml alcohol, in 50 ml of a mixture of 47.5 ml alcohol and 3.7 ml water. The aq soln is slightly alkaline to litmus. pH about 8. **Incompat:** Acids, ferric salts.  $\text{LD}_{50}$  orally in rats: 4.07 g/kg (Smyth, Carpenter).

USE: As preservative in pharmaceuticals and in food products, not more than 1 in 1000 being permitted. Its preservative effect is best exhibited in slightly acidic media; in alkaline media it is almost without effect. Clinical reagent (bilirubin assay).

Therap cat: Diagnostic aid (hepatic function).

**8528. Sodium Bicarbonate.** Sodium hydrogen carbonate; sodium acid carbonate; baking soda.  $\text{CHNaO}_3$ ; mol wt 84.00. C 14.29%, H 1.20%, Na 27.37%, O 57.14%.  $\text{NaHCO}_3$ . The bicarbonate of commerce is about 99.8% pure. Prep'd from sodium carbonate, water and carbon dioxide. Manuf: Faith, Keyes & Clark's *Industrial Chemicals*, F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) pp 702-705.

White cryst powder or granules. Begins to lose  $\text{CO}_2$  at about 50° and at 100° it is converted into  $\text{Na}_2\text{CO}_3$ . Readily dec by weak acids. In aq soln it begins to break up into carbon dioxide and sodium carbonate at about 20° and completely on boiling. Sol in 10 parts water at 25°, in 12 parts water at about 18°; insol in alcohol. Its aq soln prep'd with cold water and without agitation is only slightly alkaline to litmus or phenolphthalein; on standing or rise in temp the alkalinity increases. pH of freshly prep'd 0.1 molar aq soln at 25°: 8.3.

USE: Manuf many sodium salts; source of  $\text{CO}_2$ ; ingredient of baking powder, effervescent salts and beverages; in fire extinguishers, cleaning compds.

Therap cat: Antacid, urinary and systemic alkaliizer.

Therap cat (VBI): Antacid, systemic and urinary alkaliizer. Locally in burns, erythema, to dissolve mucus, exudates, scabs.

**8529. Sodium Bifluoride.**  $\text{F}_2\text{HNa}$ ; mol wt 62.01. F 61.29%, H 1.63%, Na 37.09%.  $\text{NaF}_2\text{H}$ .

White, cryst powder. Sol in water. The aq soln corrodes glass.

USE: As a "sour" in laundering.

**8530. Sodium Bismuthate(V).**  $\text{BiNaO}_5$ ; mol wt 280.00. Bi 74.64%, Na 8.21%, O 17.14%.  $\text{NaBiO}_5$ . The bismuthate of commerce contains about 85%  $\text{NaBiO}_5$ ; the balance is chiefly water and  $\text{Bi}_2\text{O}_5$ .

Yellow to yellowish-brown, somewhat hygroscopic. Slowly dec on keeping; decompn accelerated by moisture and higher temp. Insol in cold, dec by hot water forming  $\text{Bi}_2\text{O}_5$ , NaOH, and liberating oxygen; dec by acids; with HCl chlorine is formed; with oxy-acids oxygen is liberated.  $\text{LD}_{50}$  orally in rats: 720 mg/kg. Hanzlik et al., *J. Pharmacol. Exp. Ther.* 62, 372 (1938).

USE: For the determination of manganese in iron and steel, etc., the manganese being oxidized by it in hot  $\text{HNO}_3$  or  $\text{H}_2\text{SO}_4$  soln to permanganate.

**8531. Sodium Bisulfate.** Sodium acid sulfate; sodium hydrogen sulfate; sodium pyrosulfate.  $\text{HNaO}_4\text{S}$ ; mol wt 120.07. H 0.84%, Na 19.15%, O 53.30%, S 26.71%.  $\text{NaHSO}_4$ .

Fused  $\text{NaHSO}_4$ , hygroscopic pieces. d 2.435. mp about 315°. Sol in 2 parts water, 1 part boiling water; dec by alcohol into sodium sulfate and free  $\text{H}_2\text{SO}_4$ . **Keep well closed.**

Monohydrate, odorless crystals. When strongly heated it changes into pyrosulfate. Sol in about 0.8 part water; dec by alcohol into sodium sulfate and free  $\text{H}_2\text{SO}_4$ . The aq soln is strongly acid. pH of 0.1 molar soln: 1.4.

USE: Fusion of minerals to make them sol for analysis; for liberating  $\text{CO}_2$  in carbonic acid baths. Technical grades are used for pickling metals, carbonizing wool, bleaching and swelling leather, manuf magnesia cements, etc.

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